MONTHLY JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA
BULLETIN

FEBRUARY, 1955 · NUMBER 62

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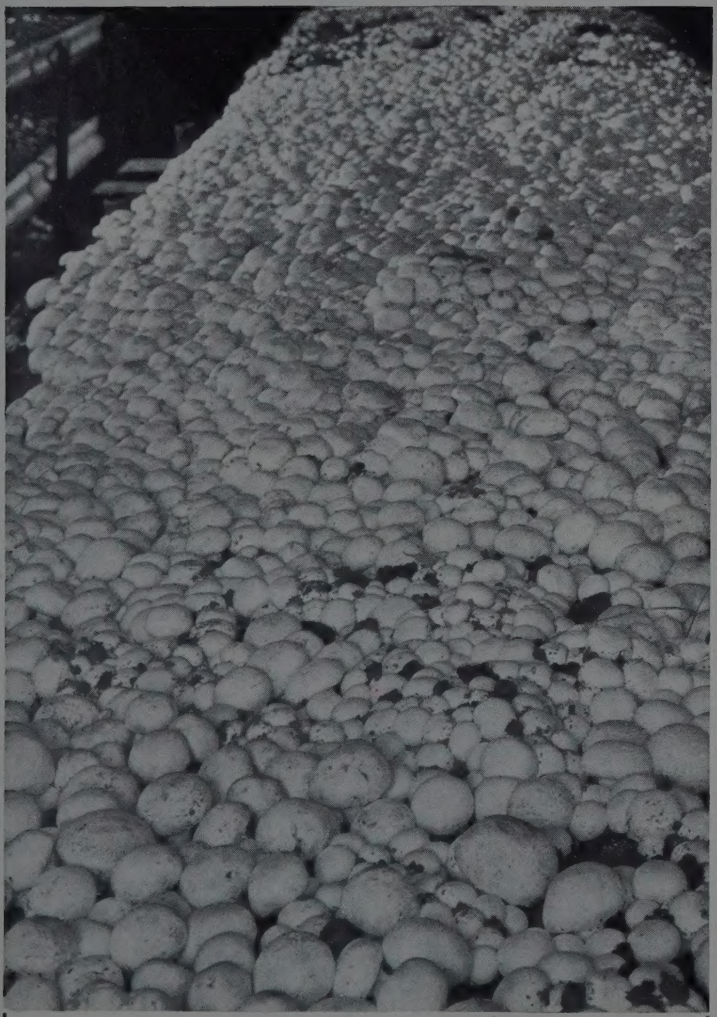

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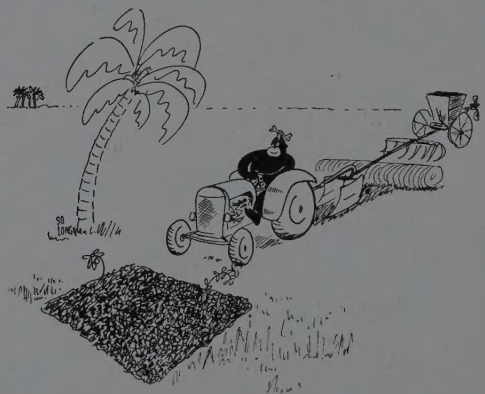

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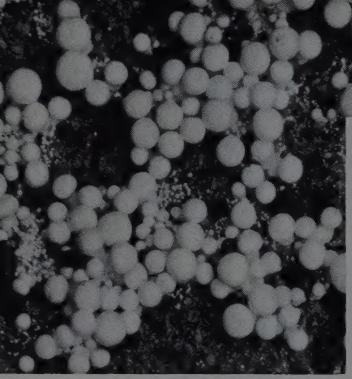

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EDITORIAL: *You will find on this page from time to time some information about spawn which we hope will be interesting to you.*

GRAIN Spawn was discovered by Dr. James W. Sinden, research Professor at the Pennsylvania State College, U.S.A., in 1930. It was introduced into American mushroom growing in 1932, by the College and the Mushroom Growers' Association of Pennsylvania. Despite consistent opposition from certain established spawn makers who feared a reduction in their business because of the economy of the new spawn, Sinden Process Grain Spawn became the spawn preferred by most of the American mushroom growers. Now more than 80 per cent. of the total annual American production is grown from Sinden Process Grain Spawn. To-day in America, there is no important grower who does not use grain spawn in preference to any other kind.

In Europe, Sinden Process Grain Spawn was offered to growers for a short time before and during the war under the name of "Albogran," made by Mlle. Du Bois-Raymond in Germany, who had studied the techniques of its manufacture at the Pennsylvania State College. When this spawn laboratory ceased to exist at the end of the war, the process was copied and Grain Spawn has been made here and there in Germany since then.

In England, Grain Spawn was first advertised in the MGA Bulletin by Pinkerton's Scottish Mushroom Laboratories, in 1950, as a new and superior kind of spawn, Mr. Pinkerton having been introduced to its use and production during a visit to the U.S.A. The other established spawn makers in England and on the Continent, however, did not put Grain Spawn on the market until recently and only then under the pressure of the growers' demand.

The E. Hauser Mushroom Laboratory in Switzerland, started to make Sinden Process Grain Spawn in 1948, in accordance with the instructions and advice of Dr. Sinden and for use in its own mushroom plant in Gossau. At the request of grower friends some of this spawn was sent to England in 1951. Since then, the Sinden Process Grain Spawn manufactured in Gossau-Zürich has been used in rapidly increasing amounts in England and other European countries. It has convinced not only the growers but also the spawn makers that the invention of Grain Spawn is one of the great advances in the history of mushroom growing.

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The
MGA BULLETIN

FEBRUARY 1955
NUMBER 62

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EDITORIAL

GREAT EXPECTATIONS

Brighton 1955, or, to be more explicit, the Annual Mushroom Industry Exhibition, Annual Lunch and MGA Annual Meeting, which has been provisionally arranged for 5th and 6th October, at Brighton, with the exhibition in the Corn Exchange, is, whichever way you look at it, an ambitious project. There is nothing at all ambitious in the fact that this annual event is to be held at Brighton but certainly something ambitious about taking the Corn Exchange for the exhibition for, mark you, this building has floor space for stands amounting to some 10,000 sq. ft., more than double that available at Tunbridge Wells for the 1954 affair. " Who doth ambition shun, and love to lie in the sun?" certainly has no application to the Exhibition Sub-Committee who, with a remarkably successful foray into Brighton on a general scouting expedition, came away with plans, not only well laid, but complete in all the general principles.

Can this large hall be pleasantly filled with stands? The answer is a most definite yes, provided that the initial drive and industry which has marked the opening stages is maintained, for there is no doubt that, successful though Tunbridge Wells undoubtedly was, the pinnacle of achievement for this annual exhibition was by no means reached.

Not only is ambition directed to the exhibition but also to other events with which it is proposed to burnish this special occasion and which are outlined elsewhere in this issue. A course of lectures is a new departure but, if early plans are brought to fruition, then these lectures will be long remembered. Further, a wide-scale publicity boost, to coincide with the Brighton effort, has also been provisionally planned.

Given the support of the members and of the trade in general there is every reason to hope that Brighton 1955 will have a special significance in the small but virile world of mushroom growers.

As a well-known personality in the horticultural world said, on hearing of this Brighton project, " Well, if you don't aim high you never achieve anything really worth while." Certainly we aim high this year. Let us hope the ultimate achievement will exceed even our own great expectations.

W.R.A.

EXECUTIVE COMMITTEE

A meeting of the Executive Committee took place at The Bedford Corner Hotel, London, on Tuesday, 11th January, Capt. G. P. Lawrence (Chairman) presiding, supported by the Vice Chairman, Mr. G. W. Baker. Other members present included Messrs. G. V. Allen, Fred. C. Atkins, F. Bleazard, F. L. Filmer, E. A. Gook, W. A. B. Harding, A. Campbell Melville (Scotland), G. V. Reed and Raymond Thompson, with the Secretary.

The meeting was chiefly concerned with the 1955 Mushroom Industry Exhibition and Annual General Meeting of the MGA, and with progress made in the matter of publicity.

As Chairman of the Exhibition Sub-Committee, Mr. Baker gave a comprehensive report on the provisional arrangements made in connection with Exhibition, etc., at Brighton, on 5th and 6th October. These arrangements were approved and Mr. Baker and his committee congratulated on making such "extraordinary good arrangements." Mr. Guy Reed, Chairman Publicity Sub-Committee outlined the terms of reference suggested for that committee and these were approved. Mr. Reed made the point that the main function of his committee was in raising money for publicity. In that direction contributions from some firms of salesmen had been most generous and an approach to others in that section and in other branches of the industry was in the course of being made. The first contributions under the spawn contribution scheme were being awaited with interest.

Among other matters the Secretary was instructed to obtain information on the preliminary proposals of the NFU on the grading of horticultural produce.

The next meeting was fixed for Tuesday, 22nd March.

PUBLICITY FUND

The Publicity Sub Committee acknowledge with grateful thanks the following additional contributions:—

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Messrs. J. Collingridge Ltd., Covent Garden (Salesmen)		50	0	0
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(To 18th January, 1955)

THE FRED. ATKINS ALPHABET—P

Packing is becoming an increasingly important aspect of our business.

Panaeolus sp. Not the Ink Cap, but much like it except that the cap is brown. Not a serious competitor.

Papulaspora byssina. Brown Plaster Mould is very partial to soggy compost and in such an environment can ruin a crop. Prevention is much simpler than cure.

Parasite. According to Ainsworth and Bisby's Dictionary, " an organism living on or in, and getting its food from, its host, another living organism."

Parathion. Diethyl p-nitrophenyl thiophosphate is one of the phosphate insecticides and is used—with proper respect and due caution, I trust, for it can be deadly poisonous to man—against mites and springtails at peak heat.

Pasteurization. Most growers who are able to pasteurize or " peak heat " their compost do so in order to eradicate most of the pests, all the parasitic diseases and most of the known fungal competitors. A pasteurizing temperature in the compost above 140° F. is considered dangerous unless it is succeeded by a sustained re-conditioning at a lower temperature, say 110-115° F. Few growers pasteurize their casing soil, at any rate intentionally, preferring to attempt to sterilize it.

Peat. On most farms where a suitable soil is not readily available, peat has superseded soil as the casing material. But it isn't foolproof. And one hears regularly that " delivery is unavoidably delayed."

Peziza spp. Yellowish " cup " fungi which sometimes occur on the beds. Usually introduced with the casing, though others blame the under-cooked compost. Often found growing on old bales of straw.

***p*H.** For growers, the *p*H scale is a means of measuring the acidity (0-7) or alkalinity (7-14) of compost or casing. In my opinion an expensive *p*H meter is a waste of money unless we are doing scientific experiments. I advocate the cheap and simple " indicators," and use the Johnson's Comparator Test Books available for a few pence from Standly Belcher & Mason Ltd., Church Street, Birmingham 3. As far as we are concerned, a *p*H of 7·5 is near enough, be it compost or casing.

Phosphate. This salt is usually added to composts in the form of superphosphate (at the rate of 7 lb. to the ton of horse-manure, applied at the final turn; this is Pizer's recommendation). Superphosphate is 16 per cent. P_2O_5. The MRA formula for synthetic compost demands 14 lb. superphosphate to the ton of straw at stacking, and another 14 lb. at the final mix.

Phoridae. The phamily of the phearsome Phorid Phly.

Phymatotrichum sp. An anaemic version of our Brown Plaster Mould. The record originates in the States; I've not heard of it being found on mushroom composts here.

Picking. The essential preliminary to Packing. There's only one proper way to pick a mushroom—but there's never time to practise it.

Pigmaeophorus americanus. This " pigmy " or " red pepper " mite is reddish coloured and wedge shaped and has an unfortunate habit of congregating on the caps of mushrooms. It is reported to be a spawn eater.

(P—*to be continued*)

FARM WALKS

With the exception of the Surrey, Kent and East Sussex areas where arrangements have already been made, any member willing to have a farm walk—area meeting at his or her farm is asked to communicate with the Secretary without delay.

Farm walks, etc., are an important part of the MGA activities during the summer months and the co-operation of members in this matter is earnestly requested.

PUBLICITY

THEY ARE DOING THEIR SHARE–ARE YOU?

The Publicity Sub-Committee of the MGA offer their grateful thanks to the following contributors to the Publicity Fund:—

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MY WAY OF GROWING

17—*By* VICTOR CANO FARO of Hongos de Mexico

Growing Mushrooms in Mexico City

I will try to give you a short history of my mushroom business in Mexico City and my method of growing. I started about seven years ago with 200 sq. meters. At first it was difficult to sell even the few mushrooms grown. My problem was not only to grow them but to develop a sale. Many weeks at first I spent more time driving around to sell my mushrooms than tending to the growing. The fear of being poisoned gradually disappeared. Demand increased and I expanded my plant to meet the demand.

At the present time I have 10,000 sq. m. of American type houses with shelf beds. They are in three blocks of ten houses each. The last block was built this summer, and has a single roof with the ridge running across the houses as shown in the photograph. The climate allows continuous cropping as in England with a temperature of 16 to 17° C. Beginning last June I have been filling the houses at an increased rate that will give me about two and a half crops a year. With this capacity my production is greater than the demand for fresh mushrooms. Therefore I must now sell more than one third of my production in cans. My canning brand is MONTBLANC. I market two grades, buttons and sliced, and each one in three different sizes.

I have had a great deal of trouble with pests and the loss of moisture in beds because of the dry climate. Last spring I installed three steam boilers of ten horse-power each, one for each block of houses. This has helped me to get a better heat and I am now obtaining better yields — about seven Kilos per sq. m.

I use horse manure, mostly from race tracks, and compost it on a concrete turning ground. I turn the manure with an American type turning machine and compost in long narrow heaps for about two weeks with four turnings. During pasteurizing I discharge steam

into each house to give us the temperature desired. I follow the BELTSVILLE SYSTEM of pasteurising temperatures. I have not been sterilizing soil in the past but now I am planning to use tear gas or steam in the future to control mites and nemas. We have most of the pests described in the Bulletin but do not have yellow mould, truffles or *Mycogone*. Flies are controlled by the generous use of Lindane around and inside the houses and Parzate is dusted on the beds during cropping.

I have learned only this year about the British MGA and its wonderful Bulletin. I very much appreciate your permitting me to become a foreign member since it puts me in contact with other growers throughout the world.

BRIGHTON *for the* 1955 EXHIBITION

The Annual Mushroom Industry Exhibition and Annual General Meeting of the MGA will take place this year at Brighton, on 5th and 6th October.

This decision was reached following a meeting of the Exhibition Sub-Committee (Mr. G. W. Baker, Chairman) at Brighton and was ratified at a meeting of the MGA Executive Committee at the Bedford Corner Hotel, London, on 11th January.

The Exhibition will take place in the Corn Exchange, the floor space available being about 10,000 sq. ft.—somewhere about twice the size of the Assembly Hall, Tunbridge Wells, scene of the 1954 Exhibition.

As present arrangements stand, and it should be appreciated that the arrangements are in the very early stages and are by no means final, the Exhibition, including the machinery exhibits, together with the running buffet and licensed bar, will all be in the same large hall, as will the mushroom competitions, whilst the other activities, such as annual meeting and a series of lectures planned to be held this year, will take place in the adjoining Concert Hall.

A new departure this year is the arranging of a series of three lectures for which it is hoped to obtain the services of internationally famous mushroom experts.

As last year the opening day (5th October) will be reserved for members and others directly interested in the industry whilst the public will be admitted on the second day, as at Tunbridge Wells. This year however, a far greater effort is to be made to interest the general public.

By and large the 1955 plans are wider in scope and show more imagination than anything previously attempted by the MGA in this field, and the Exhibition Sub-Committee, supported by the Executive Committee, sincerely hope that the members and the trade in general will give this venture their full support.

The preliminary programme is listed herewith and is, of course, subject to alteration.

To the MGA members overseas and indeed to anyone interested in the Industry, a warm welcome is extended to this annual event.

On the question of hotel accommodation, a word of early warning is most necessary. Brighton, in October, is a most favoured resort and hotel accommodation, even so late in the season, is by no means easy.

Members and others requiring such accommodation are strongly advised to make their bookings as early as possible. To facilitate this an illustrated Guide to Brighton, together with a list of hotels, is being sent to all members, at home and abroad, within the next few days.

The Mayor of Brighton will give a reception on the evening of 5th October, and the MGA Chairman's reception at noon the following day at the Old Ship Hotel is to be followed by the Annual Lunch.

The opportunity for publicity on a national scale, afforded by the selection of Brighton, has not been overlooked and present plans are for a publicity campaign on a much larger scale than has hitherto been possible.

Programme:—

4th Oct. Informal Dance.

5th Oct. 10 a.m. Trade Show, Corn Exchange.
10.30 a.m. to 12.30 p.m. Lecture, Concert Hall.
11 a.m. Competition judging.
3—4 p.m. Lecture, Concert Hall.
8.30 p.m. Reception by Mayor of Brighton.

6th Oct. 10 a.m. Trade Show, Corn Exchange, open to public.
10.15 a.m. MGA Annual Meeting, Concert Hall.
11.45 a.m. Executive Committee Meeting.
12 noon: Chairman's Reception, Old Ship Hotel.
1.15 p.m. Annual Luncheon, Old Ship Hotel.
3—4 p.m. Lecture, Concert Hall.

AN AMERICAN GROWER'S DIARY

By JOSEPH M. MICHAELS, Naperville, Illinois

10th December, 1954

To-day we are sterilizing casing soil. We have departed from the conventional steam sterilization because with our steaming equipment the soil was made too wet, the heating was non-uniform and the method entirely too slow. We have, instead, a butane flame device. This machine was developed at Cornell University to sterilize greenhouse soils. Soil borne nematodes are completely destroyed as are the larvae and eggs of Cecid flies, and all the mites. I have not found a single *Mycogone* or *Verticillium* diseased mushroom in my houses this fall—this control is almost unbelievable when compared with previous crops before the flash flame method was adopted. I might mention that we dust with 'zineb' once weekly because a prophylactic fungicide is needed even in a sterile house to cope with airborne invasions during cropping. I would like to briefly describe the flame pasteurizing device for those growers who might find this novel method interesting.

A roller chain slowly revolves a heating drum mounted on four bushed rollers. The drum is about five feet long and has a diameter of $1\frac{1}{2}$ feet. The drum is inclined at an angle (variable) with the frame of the machine. Inside the drum angle irons agitate the soil as it tumbles down the incline. As the soil approaches the outlet it is exposed momentarily to a fierce gas flame which is directed into the drum from a swivel mounted burner. The burner is swivel mounted so that the flame can be directed out of the drum when soil is not passing through. The drum is revolved by a one-horsepower electric motor. The angle of inclination is adjustable. (A 10° angle with the horizontal will yield a soil at around 175° F.) The angle of inclination determines the duration of time that the soil is heated. The gadget is mounted on wheels for portability and weighs around 600 pounds. Parts of this gadget are home-made, and much of it has been purchased. Actually it is a heat transfer machine. Unlike a steam generator where a flame first makes steam and then the steam heats the soil, the soil here is heated directly. Herein lies its good efficiency.

We can sterilize around five yards of soil per hour. It takes one day to sterilize enough soil to case 12,000 square feet. I would like to draw a sketch of this gadget when time permits for those who might be interested.

This idea in soil sterilization is excellent for treating soil that is ordinarily too wet. The flame dries the soil and comminutates the big lumps. The roller action of the drum produces a soil that is granular and pelleted. The soil continues to heat in the pile for several days if means are not taken to check this prolonged heating. For those of us who find 'pore space' in casing soil important this is ideal soil. Steamed casing soil is ordinarily too packed and is impervious for thorough gaseous exchange between the compost and the so called macro-climate.

THE PROOF OF THE SPAWN—
IS IN THE CROPPING!

Messrs. R. H. & R. S. Fryer, and below, a view of their farm at Chesham.

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WORTHING • • • SUSSEX

26th December, 1954

I sometimes wonder if our perspective on soil sterilization is adequate. Each soil particle is a complex culture of micro-organisms. To some growers the purpose of sterilization is to destroy completely the life in soil. They assume that all soil micro-organisms are antagonistic and hostile to the mushroom. But agronomists and bacteriologists and especially the ecologist have devoted lifetimes of study to the associative effects amongst the micro-organisms and their relationships to higher plants. For example we recognize symbiosis and commensalism where micro-organisms like actinomycetes and primitive fungi are necessary for the tuberization in plants, and in the protein physiology of certain seeds. We destroy this beneficent and associative life in the casing soil, and I wonder if we do not that way destroy the potentially phenomenal mushroom crops. I agree that casing soil does not supply nutrients for the mushroom, but it is necessary for fructification. Herein, I think that the micro-biological world is functional, and possibly this is the very reason why we have to case beds to get mushrooms.

It is true, we know, that cinders and other sterile casing materials will produce mushrooms. Am I to dismiss the importance of micro-organisms? I hardly think so. This micro life is there in the compost and on the surface of the compost, and it invades the casing material together with the mushroom mycelium.

We have to accept the idea that soil life is not all inhibiting to mushroom growing, but also that soil life produces stimulating substances for fructification. Might it not be true that soil which is injured by heat is a soil in which we manage to destroy the various good bacteria, and actinomycetes and good fungi. Perhaps it is true that these various micro-organisms are necessary in the casing soils for the following reasons: (1) They stimulate the physiological processes behind the growth of the sporophores by producing the necessary hormones, vitamins and auxins, and (2) they protect the rhizomorphs and maturing sporophores against pathogens (like *Fusarium*) by inhibiting their development or by destroying them. To deny this inhibitory function of micro-organisms would be to deny that antibiotics exist in this world.

Perhaps we could improve crop yields in mushroom houses not unlike we improve legume yields, when we inoculate peas and clovers, etc., with nitrogen fixing bacteria. Of course we first would have to learn which bacteria and micro-organisms are beneficent and associative. I can picture casing a house with sterile soil and then dusting with an electric duster a culture of the necessary micro-organisms, so essential for that bumper crop. Of course, I too enjoy wishful thinking. But, unlike the Fred. Atkins Alphabet. I cannot " poo-poo " biological control.

2nd January, 1955

Sunday is a good day to look over mushroom beds and to do some reminiscing about old and new problems, and to question some deep seated convictions about mushroom growing. Last October, we cased 50 square feet of beds with spent mushroom compost that had been

lying in a pile for about two years and was in a good state of decomposition. (It was the kind of stuff that organic gardeners drool over.) This compost was laden with a whole plethora of mushroom enemies when it was dumped. It was passed through the flame soil sterilizer, and sweetened with lime. I remember that it never got very hot (around 125 degrees) and it cooled quickly because the pile was small. We picked from these beds large mushrooms every time through the entire cropping period. In all other parts of the house (4,000 square feet) the mushrooms were numerous but small for the first four or five breaks. As the crop advanced these became larger and firmer and looked like the mushrooms picked during the first breaks from beds cased with the spent manure. I am wondering if fructification (whether mushrooms are small and numerous, or big and fewer, and more desirable) is not again related to the microbiological life of the casing soil. Some day, I hope to work up enough courage to case an entire house with old spent mushroom manure.

ANY OFFERS?

Paul Hulley, aged 24, of P.O. Box 455, Umtali, Southern Rhodesia, a member of the MGA, is anxious to spend some months on an English mushroom farm in order to gain further experience. He has already been growing mushrooms, with his father, for some years. He is willing to give his services free. Any member interested should communicate with the Secretary immediately as Paul is due to arrive in England, early in March.

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YAXLEY RESEARCH REFLECTIONS

By P. B. FLEGG, B.Sc., A.R.I.C.*

During the last few years at Yaxley there was a steady stream of samples from those in trouble, some in search of better materials and others growing for the first time.

Sometimes it was possible to give sound advice based on experience and the results of research, on other occasions all that was possible was a few tentative suggestions which may or may not have been successful. There were also instances where nothing could be done to help. Research into mushroom growing is relatively recent, and compared with our knowledge of green plants there are many aspects of which very little is known. However, the case for research has been stated several times. In this article I am going to consider the ways in which growers may help themselves to obtain better results.

A cause of poor yields, which is difficult to diagnose from samples sent by post, is lack of attention to detail and insufficient care in making composts, casing, etc. It cannot be over emphasised that a little extra care will pay dividends. What may seem unnecessary fuss over detail is often justified. Consistently high yields can never be obtained by slack methods.

It is important to make sure that the casing layer is of uniform thickness throughout each house. This layer of soil or a peat mixture is comparatively thin and variations in depth will cause the moisture content to vary considerably after watering.

When applying insecticides or fungicides always follow the instructions. The temptation to add a little more for luck should be resisted, the luck accruing from such actions is often bad.

Cleaning the beds and strict precautions against the spread of disease must never be neglected. A period of several practically trouble-free crops must not lead one to become complacent about pests and diseases ; it is a good plan at intervals to check up on farm cleanliness and hygiene. Complacency and freedom from trouble should never be allowed to cause a slacking off in carrying out precautions.

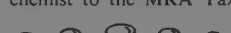
Mushroom growers are very keen to try new methods and materials. This is a good sign for the industry; one rarely comes across the " stick-in-the-mud " frame of mind which does not like " new-fangled " ideas. However, some word of caution is necessary here. Many times a grower full of enthusiasm for a new method has had to be restrained from changing his whole farm over to the new idea at once. A small area, say one shelf, should be used for trials before making major changes. A failure on a large scale can be very costly. One must at the same time keep a sense of proportion. There has been a case of growing mushrooms on an area of less than 5 square feet as a preliminary to large scale growing. Such a small area is most unlikely to give a fair idea of probable results on a much larger scale.

In carrying out such tests on the farm it is better to limit the scope of each trial, preferably to a straight comparison, such as between two casing materials or two methods of watering. One must always bear in mind effects due to position in the house. An experiment in which each of six shelves is planted with a different spawn will not give much information about the relative yielding properties of the spawns. It may serve only to show that in the house in question some shelves are better placed with respect to heating, ventilation, etc., than others.

Occasionally one meets a grower who, despite reasonable yields (2 lb. per sq. ft. $2\frac{1}{2}$ times per year is reasonable), wishes to make drastic changes in the hope of increased yields. Such changes are often based on hearsay or results obtained under conditions differing widely from those of the grower concerned. In such cases it is often much better to look for increased yields by modifications of the present way of growing. Such modifications could take the form of altering the watering treatments or ventilation procedures. Such a grower is better advised to concentrate on improving a system of growing which is giving reasonable yields rather than changing to new and untried materials.

It may seem with a research station to carry out work on the various problems of growing that experiments by growers themselves may be an unnecessary risk or even something which should be left to the scientist. It is important to remember that even when a new discovery, whether a new insecticide or casing medium, has been tried out and found to be satisfactory by research work even under commercial conditions, the new method has to be tried by the growers themselves. It is difficult, if not impossible, for the research worker to be certain that the new method will be equally satisfactory under the many varying conditions under which mushrooms are grown. The grower himself has to accustom himself to the new method, he has to learn how to adapt it to his own farm and system of growing. It is inevitable therefore that some experimentation must be left to the grower. It is the grower himself, with help and advice, who is best able to bridge the gap between the results of research work and successful practical application of those results.

*(P. B. FLEGG was chemist to the MRA Yaxley for some years.)



Concern in America over Imports of Canned Mushrooms from France

A report in the New York Journal of Commerce reads:—

FRENCH MUSHROOMS

T. R. Schoonmaker, executive secretary of the Association of Food Distributors, Inc., this city, in the association's bulletin to the trade revealed that the purpose of the recent meeting of importers and import agents who handle French canned mushrooms was to consider the threat to importers of additional duties they might have to pay under the anti-dumping laws and regulations of the Treasury.

It was also reported that at the time of the meeting a representative of the Treasury Department was in France making inquiry as to whether the anti-dumping laws applied to the French mushroom situation.

No definite action was taken at the meeting and it was decided to wait the results of the investigations.

DOWN TO EARTH – 2

By **Dr. R. L. EDWARDS**

Ventilation

Any attempt to get right " down to earth " and give simple practical directions for control of ventilation is doomed to failure from the start, and a simple example will show the reason for this. The object of ventilating a mushroom house, which means replacing the air inside it by fresh air, is to supply oxygen and to remove carbon dioxide, water vapour, and any other gases produced by the mushroom and other organisms growing in the beds. Clearly the amount of these gases produced depends on the amount of growing material and hence mainly on the quantity of beds in the house. A typical house of 7,000 cu. ft. may have 1,600 sq. ft. of shelf beds, holding about 20 tons of compost. Or if it is used for floor beds there may be only 600 sq. ft. with about 10 tons of compost. The first of these will need just about twice as much ventilation as the second to maintain the same available oxygen supply, etc. This is an extreme example, but there is quite a wide range of variation amongst normal shelf and tray houses, too wide for a single arbitrary rate of ventilation to be laid down as ideal for all cases even if it was known what the figure should be. My own estimate is that for typical shelf or tray houses with about 4 cu. ft. of air space per sq. ft. of bed the minimum rate of ventilation desirable to prevent crop damage is one change of air per hour.

It is desirable to work as near to the minimum as possible in cold weather to save loss of heat, and also to maintain humidity in the air. Cold air on heating becomes relatively drier, and it is undesirable that it should take up too much moisture from the beds.

In very dry weather also the second of these reasons applies, and excessive ventilation should be avoided. But if for example the outside air has a temperature of 60° F. and Relative Humidity over 80%, I know of no reason why ventilation should not be given *ad lib*, and I should favour doing so. Alternatively if temperature and humidity of the air in the house can be maintained artificially there is no cultural reason why ventilation should be restricted, and it may then be worth while increasing the rate to say four changes an hour or even more. I know of no definite work on the ideal rate under such conditions.

One further point is that high bed temperatures increase the oxygen consumption, etc., and thus call for a higher rate of ventilation.

So far I have been discussing ventilation during the cropping period. Some ventilation is necessary during peak-heating; I am not prepared to give an estimate of the amount, but I am sure some growers, particularly with trays in a crowded heat room, do not give enough and their crops suffer in consequence.

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A little ventilation must be needed during spawn running, as oxygen is being used up quite vigorously by the growing spawn. It is commonly said that no ventilation is needed at this time, and particularly with shelf houses this may be true as far as deliberate ventilation is concerned, but only because there is always some leakage of air, enough to provide a change every few hours, without opening ventilators. Only an exceptional house is really air tight. Again I think there is some risk that trays in a crowded heat room may suffer from lack of ventilation at this stage. They are commonly packed at least twice as tightly as the beds in a shelf house, and the popular saying that no ventilation is needed during the spawn run is very misleading in this case.

Circulation of Air

When fresh air has been introduced into the house it must be distributed evenly to all parts of the beds. This is a separate thing, and it is quite possible to have an ample rate of ventilation for the house as a whole, yet for one part of it to be starved of fresh air, or at the opposite extreme for the air in a house to be circulated over the beds too fast (usually by fans or an air conditioning system) without enough fresh air being admitted to the house.

There are no data on which to base any kind of estimate of a minimum rate of circulation, but there certainly is a maximum particularly if the air is at all dry. The Dutch research workers found this with their air conditioning system and they recommend that the rate of air movement over the beds should not exceed 20 feet per minute (one fifth of a mile per hour).

The rate of evaporation from a wet surface is directly proportional to the rate of air movement over the surface so that rapid air movement dries out the beds very quickly.

In shelf houses with heating pipes along the sides the natural convection currents are probably sufficient, providing a gentle flow of air over each shelf, but in summer when the pipes are not in use there may be insufficient or irregular circulation.

It is much more difficult to provide even circulation through all the openings in a stack of trays, and I think artificial circulation is necessary for this, with control of humidity to prevent excessive drying.

Is all this " Down to Earth "? Perhaps it is only an apology for our incomplete knowledge, but I hope it also explains some of the reasons why a rule of thumb answer cannot be given, except perhaps for particular houses in relation to their size, design, manner of use, etc.

GROWING IN STEPS FIRST

by McGregor Bulloch

13—ROUTINE INSPECTION FOR DISEASES AND PESTS

When a mushroom farm has been developed to the stage where a regular cycle of operations is in being, there is usually a new compost to be laid down each week, with the result that some major operation occurs every day, such as filling or emptying beds or trays, spawning, casing and turning of composts. With the ever increasing cost of labour it is natural to omit or delay any task not considered absolutely essential to the running of the farm.

For this reason, many growers do not make a serious effort to keep an unceasing look out for the early development of diseases and pests. Nor do they feel it worthwhile to pay the wages of an extra hand to do it for them.

Looking for diseases can become rather monotonous where the seeker is not normally interested in mycology, and when a long run of trouble free crops has been experienced. Sooner or later, however, routine inspection will pay for itself, and by routine inspection is meant *daily* inspection.

Unfortunately the novice is rather handicapped on such work since, without mycological training, it is difficult to identify many of the diseases in their early stages, even when handbooks are available with excellent photographs and descriptions. Obviously it is a good plan to keep in touch with neighbouring growers and to get their permission to inspect any disease they may have on their farms. In this way it may be possible to study the disease in its various stages. It may be some years before a new grower has experienced attacks of most of the well-known diseases on his own farm, and if he is able to accustom himself to their habits before they appear, he may save himself serious trouble in the future.

As for the inspection itself, although much can be seen with the naked eye, far more remains completely hidden. A good lens is essential, although ironically enough, many seasoned growers get quite a shock when they do use one, especially in connection with the insect population of the growing houses. For instance, it is unusual *not* to find a few mites, fly larvae or an odd eelworm or so in the average mushroom house, and the sooner this is realized, the better. It is when the population of the particular pest starts to increase abnormally that there is a necessity for some action to be taken.

Included among diseases are various fungi which are not strictly diseases but competitors of the mushroom, in that they flourish in the same medium as the mushroom mycelium, i.e., the compost. These fungi are the ones which should be detected as soon as possible, since

the majority of them are incurable once they have taken a good hold in shelf beds. Tray growers are more fortunate, in that these competitors do not spread from tray to tray. The usual sign of a competitor in the beds is the deterioration in various ways of the quality of the mushroom, without there being any sign of the outward damage which occurs when a parasitic fungus is attacking the mushroom tissue. Usually there is a well-defined patch on the bed with unhealthy-looking mushrooms contrasting with the rest of the crop, or in severe cases, no mushrooms at all will appear in certain areas. Whatever the cause, something can usually be done, if only to employ the drastic remedy of cutting off the affected portion by digging an isolating trench across its path.

When we consider parasitic diseases of the mushroom it must be obvious that early detection is essential. Yet there are growers of long experience who still do not take any steps until the disease is well advanced, and when it is too late to prevent the heavy losses which might follow.

One diseased mushroom may well lead to spores of the disease settling on the casing throughout the house so that many mushrooms in the next flush are affected, and so on. Therefore, the simplest of all methods of disease prevention is the careful destruction of all such diseased mushrooms. The word "careful" is employed advisedly. It is of the utmost importance that each diseased mushroom is treated carefully, as though it were liable to explode if moved too quickly. If there are only a few diseased specimens, there is no reason why the removal of each one should not be a study in slow motion, for the minute spores are easily dislodged by air movement and will float for a long time in the air, eventually settling on other mushrooms or on the casing, to come into contact with the young pinheads of the next flush.

By inserting the blade of a knife into the stalk, the mushroom can usually be levered out of the casing and should slowly be transferred to a pail containing 2½% formaldehyde or 1% cresylic acid solution. The knife blade is then stirred around for a moment before the next specimen is tackled. The area surrounding the spot from which the diseased mushroom is removed should be sprayed with 2½% formaldehyde solution (not cresylic acid, which has a residual effect), or some finely powdered hydrated lime may be dusted liberally over it.

Some diseases such as *Dactylium*, known as 'Cobweb' disease, are not confined to the mushroom itself, but spread over the casing as well, frequently over a large area. Spraying is not always effective, because the air movement generated by the force of the spray tends to dislodge spores of the disease and there is a spread elsewhere. It is not difficult to make up a transparent hood to cover the diseased area before spraying, the nozzle of the spray being inserted through a suitable aperture in the hood. Perhaps a better method is to remove the casing and mushrooms bodily with a sharp broad scoop, until all signs of the disease have been removed. Here again the contents of the scoop should be deposited in a pail of disinfectant.

There are many fungicides in use to-day against different diseases, but the purpose of this article is to get the novice into the way of applying them in a sensible manner.

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NEW WAGE RATES

From time to time enquiries regarding wage rates are received at the MGA Office and in order to acquaint all members with the new wage rates, following the recent increases, the wage tables are printed below.

The new rates came into force for the week concluding the pay day Friday, 28th January, 1955. All counties in England and Wales, other than Cambridge, Isle of Ely, The North, East and West Ridings of Yorkshire, and Holland (Lincs.) are affected.

A.—RATE OF WAGES: IN RESPECT OF A 47-HOUR WEEK

Male Workers

Years of age	Per week s. d.
21 and over	127 0
20 and under 21	111 0
19 and under 20	102 0
18 and under 19	92 0
17 and under 18	80 0
16 and under 17	68 0
15 and under 16	59 0

Female Workers

Years of age	Per week s. d.
21 and over	96 0
18 and under 21	90 0
17 and under 18	75 0
16 and under 17	65 0
15 and under 16	52 0

B.—PART-TIME AND CASUAL WORKERS

Male Workers

Years of age	Per hour s. d.
21 and over	2 8
20 and under 21	2 4
19 and under 20	2 2
18 and under 19	1 11
17 and under 18	1 8
16 and under 17	1 5
15 and under 16	1 3

Female Workers

Years of age	Per hour s. d.
21 and over	2 1
18 and under 21	1 11
17 and under 18	1 7
16 and under 17	1 5
15 and under 16	1 1

C.—OVERTIME

Male Workers

Years of age	Normal Day Per hour s. d.	Short Day Per hour s. d.	Public Holidays, Agreed Sundays, Per hour s. d.
21 and over	3 5	4 1	
20 and under 21	2 11	3 7	
19 and under 20	2 9	3 3	
18 and under 19	2 5	2 11	
17 and under 18	2 2	2 7	
16 and under 17	1 10	2 2	
15 and under 16	1 7	1 11	

Female Workers

Years of age	Normal Day Per hour s. d.	Short Day Per hour s. d.	Public Holidays, Agreed Sundays, Per hour s. d.
21 and over	2 7	3 1	
18 and under 21	2 5	2 10	
17 and under 18	2 0	2 5	
16 and under 17	1 9	2 1	
15 and under 16	1 5	1 8	

D.—HOLIDAY REMUNERATION

Male Workers

Years of age	Weekdays s. d.	Sundays s. d.
21 and over	21 2	16 4
20 and under 21	18 6	14 4
19 and under 20	17 0	13 0
18 and under 19	15 4	11 8
17 and under 18	13 4	10 4
16 and under 17	11 4	8 8
15 and under 16	9 10	7 8

Female Workers

Years of age	Weekdays s. d.	Sundays s. d.
21 and over	16 0	12 4
18 and under 21	15 0	11 4
17 and under 18	12 6	9 8
16 and under 17	10 10	8 4
15 and under 16	8 8	6 8

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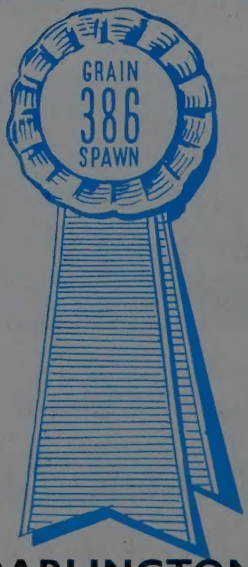

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